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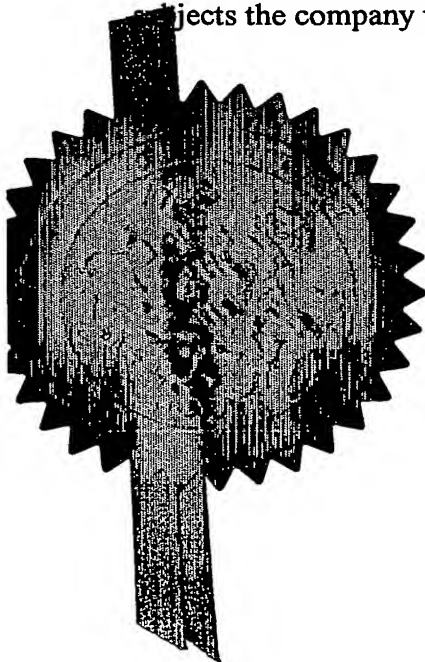
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16 APR 2003 16:00:00  
P01/7760 0.00-0308772.3

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1. Your reference

2. Patent application number  
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3. Full name, address and postcode of the or of each applicant (underline all surnames)

Patents ADP number (if you know it)

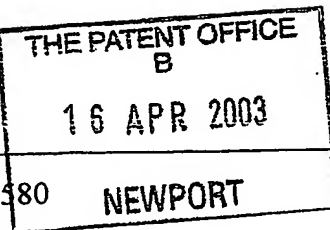
If the applicant is a corporate body, give the country/state of its incorporation

4. Title of the invention

5. Name of your agent (if you have one)

"Address for service" in the United Kingdom to which all correspondence should be sent (including the postcode)

Patents ADP number (if you know it)



0308772.3

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7774078001

16 APR 2003

AUTOMATIC ROULETTE WHEEL

COHEN, ALAN NICOL  
2 GROVE PLACE  
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6963557001

6. If you are declaring priority from one or more earlier patent applications, give the country and the date of filing of the or of each of these earlier applications and (if you know it) the or each application number

Country

Priority application number  
(if you know it)

Date of filing  
(day / month / year)

7. If this application is divided or otherwise derived from an earlier UK application, give the number and the filing date of the earlier application

Number of earlier application

Date of filing  
(day / month / year)

8. Is a statement of inventorship and of right to grant of a patent required in support of this request? (Answer 'Yes' if:

NO

- a) any applicant named in part 3 is not an inventor, or
  - b) there is an inventor who is not named as an applicant, or
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Description

Claim(s)

Abstract

Drawing(s)

1

9

3

1

5 + 5 *11*

10. If you are also filing any of the following, state how many against each item.

Priority documents

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Statement of inventorship and right to grant of a patent (*Patents Form 7/77*)

Request for preliminary examination and search (*Patents Form 9/77*)

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I/We request the grant of a patent on the basis of this application.

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A. N. Cohen

01959 577172

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## Automatic Roulette Wheel

The present invention relates to gaming wheels, more particularly it relates to roulette wheels in which the ball is automatically put in play.

5

Roulette is a well-known casino game which has been played for many years. A typical conventional roulette game includes a table bearing, a felt covering upon which indicia forming a betting layout has been silk-screened or otherwise imprinted. A typical roulette wheel includes a number ring bearing a circular array of numbered  
10 segments bearing numbers 1 through 36. In addition, the number ring typically includes the numbers 0 and 00 disposed at diametrically opposite locations on the number ring. The numbers 1 through 36 are not disposed in numerical order, but are typically disposed in a predetermined arrangement, such that roulette wheels located in different casinos will have the same standard predetermined number ring  
15 arrangement. The numbers disposed in a circular array in the number ring region of the wheel bear the alternating colours of red and black, with the exception of the 0 and 00 numbers, which are typically coloured green. A ring of pockets corresponding in number to the plurality of numbers of the circular number ring lies adjacent, but radially inward of the number ring, on the typical roulette wheel. In addition, a typical  
20 roulette wheel includes a circular, inclined ball track, disposed above, and radially outwardly of the number ring.

In operation of a typical roulette game, players place chips or tokens on the betting layout located on the roulette table, and then the croupier or dealer spins the roulette  
25 wheel to place the ball in motion about the circular ball track. As the wheel slows, the ball moves radially inwardly and comes to rest in one of the pockets associated with a particular one of the numbers of the number ring. After the ball comes to rest in one of the pockets, the croupier or dealer settles the various wagers placed on the table layout in accordance with predetermined rules and wager odds and the process  
30 repeated.

In order to reduce costs, automatic roulette wheels have been devised in which the process of putting the ball in play is done automatically; these machines can be made

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like slot machines with the bets being placed and winnings paid out using a machine rather than a croupier. This reduces the costs associated with security, chips, dealers etc.

- 5 In a known system, in order to recover the ball after each spin, a trap door opens beneath the pockets and the ball drops through this trap door and passes through a series of channels and is returned back up to its starting position. The ball can then be put in play by a solenoid firing the ball onto the ball track.
- 10 Another system is disclosed in US Patent 4735416 in which the wheel is displaced relative to a rim and the ball falls into the gap formed and into a return channel under the wheel for returning to its start position.

- Such systems involve the ball disappearing from view and involves complicated
- 15 machinery to recover the ball and to fire it into play. Such complication requires a great deal of maintenance and servicing, particularly to maintain the accuracy of the wheel and the randomness of the winning numbers.

- We have now devised an automatic roulette wheel which reduces these problems.
- 20

- According to the invention there is provided a gaming apparatus which comprises (i) a stationary base; (ii) a wheel having a rotor rotatably mounted on a vertical axis with respect to the base, the rotor having pockets on its periphery into which a ball can be received with each pocket being associated with a number; (iii) a peripheral inclined
- 25 surface concentric with the rotor for receiving a ball rollably thereon in which the ball will roll into one of the pockets when the ball slows, the said surface comprising a circular, inclined ball track, disposed above, and radially outwardly of the rotor and (iv) means to propel the ball along the ball track, each pocket having a hole in its lower surface and there being at least one air injection means which is connectable to
- 30 the said hole so that a ball received in a pocket can be ejected from the pocket onto the peripheral inclined surface by air coming out of the hole.

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The apparatus is particularly suitable for use in playing roulette but it can be used for any other game which is played on a roulette wheel or roulette type wheel and can include games in which more than one ball is in play during the game.

- 5 The roulette wheel or rotor is able to be rotated in both directions.

The means for propelling the ball along the said ball track are preferably air jets positioned at the edge of the ball track which can direct a jet of air at the ball thus impelling the ball along the ball track. The speed of the ball will cause centrifugal  
10 force to cause the ball to move to the outer edge of the ball track where preferably there is a rim to prevent the ball leaving the ball track.

Preferably the air injection means for ejecting the ball from the pocket comprises a nozzle connected to an air pump or other source of air at above atmospheric pressure  
15 which nozzle is aligned so that it is directly in line with the holes in the pockets as the wheel rotates. Preferably the gap between the nozzle and the hole is kept to a minimum. A ball detector means such as an optical sensing system of the type which is well known in the art or as referred to below, senses which pocket the ball has finished in and the wheel can be brought to a virtual standstill with that pocket  
20 aligned with a nozzle. After the ball is ejected from the pocket, the direction of rotation of the wheel is reversed for the next go.

Preferably there are a plurality of nozzles e.g. 2, 4 or 8 spaced around the wheel and the air can be directed to that nozzle which is aligned to the pocket with the ball in it.  
25 There can be a computer control system which controls the rotation of the wheel and the timing of the air which ejects the ball from the pocket.

In use, at the end of a turn the ball is resting in a pocket and the rotor is rotating slowly or is stationary. As the wheel slows the pocket with the ball in it passes an  
30 outlet from an air source and is slowed to a virtual stop and a jet of air ejects the ball from the pocket; the ball runs up the ball track to the edge where it is propelled around the ball track by the jets of air. The wheel is then reversed and brought up to speed.

After a predetermined time the air jets are turned off and the ball then spirals down the ball track to the contra-rotating wheel thus simulating the action of a croupier.

- 5 Preferably there are a plurality of jets positioned around the periphery of the rim of the ball track so that the ball can be propelled along the rim for the required period of time, normally a few seconds, and then the jets can be turned off so that the ball will spiral down simulating the action of the croupier.
- 10 Preferably there are air jets positioned to propel a ball in either direction, clockwise or counter clockwise, as croupiers can spin the wheel in either direction and the ball can then circulate around the ball track in the opposite direction to the direction the wheel is rotating. The jets are preferably angled downwardly.
- 15 Without the air jets or other means to propel the ball the ball tends to bounce off the rim and is then thrown back against it in a manner which is unsatisfactory and gives an unrealistic effect.
- 20 Preferably there is a transparent cover such as a glass or transparent plastic cover over the apparatus such as a transparent sheet which fits into the apparatus in the rim above the air jets. This has the effect of improving the action and control of the air jets. The central rotor is then mounted so that it fits beneath the sheet. Above the sheet is preferably a static turret. This turret preferably has a smooth reflective surface and can be, for example, in the shape of a cylinder or has a circular cross section of  
25 varying diameter along its length i.e. it has a curvilinear shape. In use, the numbers of the wheel are reflected in the turret and, as the wheel rotates, the turret has the appearance of movement.
- 30 Preferably there are a plurality of ball stops uniformly located around the peripheral inclined surface; in a typical wheel there can be eight ball stops and the air jet positioned so that the ball is ejected between the ball stops.

Preferably the operation of the wheel, the turning on and off of the air etc. is computer controlled.

5 In addition, to incorporate further random effects the duration of the time the air jets are on and the time to reverse the direction of rotation of the wheel can be random so there is no predictability about the operation of the apparatus.

10 The motor is preferably a stepper motor which enables there to be accurate control of its operation and preferably the motor is coupled directly to the rotor e.g. by a friction drive with a step down gearing to give high torque drive to the rotor and wheel which improves control.

15 Optionally the outermost section of the ball track adjacent to the rim is at an angle to the horizontal which is less than that of the rest of the ball track. This means that, in use, less centrifugal force is required to hold the ball against the rim than is required to propel the ball up to the rim. In use, when the ball reaches this outermost section, it will tend to stay against the rim as the ball track slows down or the air jets are turned off and when it leaves this section it will then rapidly spiral down to the wheel and to a pocket.

20 Preferred angles of the ball track to the horizontal are ten to thirty degrees and preferred angles of the outer most section are from one to ten degrees to the horizontal with the angle of the outermost section being smaller than the angle of the rest of the ball track.

25 A typical angle of the ball track to the horizontal is twenty degrees and a typical angle for the outermost section is five degrees. The width of the outermost section of the ball track is preferably about the diameter of the ball.

30 Alternatively the slope of the ball track can change from a greater angle to the horizontal adjacent to the wheel to a smaller angle at the outer rim e.g. by the ball track having a curved profile rather than a straight one. The rate of change in angle



can be uniform or non uniform. Typically the angle to the horizontal can change from twenty degrees adjacent to the wheel to five degrees adjacent to the rim.

5 There can be a fixed outer rim peripherally outward and at the top of the ball track which can incorporate a ball reader so that the position of the ball in a pocket is automatically noted and recorded. A suitable reader is described in patent Application WO 01/32278.

10 It is a feature of the present invention that there is no need to affect the structure or operation of the roulette wheel by means of trap doors beneath the pockets or moveable rims in order to recover the ball so that it is easier to maintain the randomness of the wheel and the ball is in sight of the players at all times. The invention is also virtually silent in use.

15 The invention is useful in conjunction with automatic roulette wheels in which bets are placed via slots or other similar mechanism using coins, notes or tokens and the roulette wheel is spun automatically using the present invention. A payout mechanism can be provided to calculate the winnings and to pay them out in coins, tokens etc. The payout mechanism can include a microprocessor to calculate the amount of  
20 winnings on different types of bets, thus enabling completely automatic gaming to take place.

The invention is described in the accompanying drawing in which:-

25 Fig. 1 shows a side view of part of a roulette wheel incorporating an embodiment of the invention

Figs. 2 shows an enlarged view of part of fig. 1

Figs. 3 and 4 show a plan view showing air jets

Figs. 5 shows a schematic view of a section of the ball track

30

Referring to fig. 1 a roulette wheel has a rotor (11) mounted on an axle (12). There are pockets (13) on the periphery of the rotor and each pocket is numbered and coloured. Surrounding the rotor (11) is ball track (14). There is a fixed top rim (15)

around the ball track (14) in which there is a number recording device which detects which pocket a ball is in and enables this number to be displayed and recorded. There is a nozzle (35) which can be aligned with air feed (36). There are air jets (30) in top rim (5) located as shown in fig. 3 and transparent rigid plastics cover (31) over the wheel. The axle (12) stops beneath the cover (31) and there is a reflective turret (32) mounted over (12). The rotation of the rotor (11) is controlled by motor and the sequence of events controlled by computer. There are ball stops (33) which divide the wheel into sections. The location of the pocket containing the ball is detected by a ball detector as described below and the timing of the air jets and alignment of the nozzle (35) and hole (36) are controlled by the computer.

Referring to fig. 2 which shows one pocket in wheel (40) all the pockets have the same configuration. An air line (37) is connected to a source of air above atmospheric pressure, and the pocket (13) has a hole (36) in it connected to a tube (35). The tube (35) is aligned with the air line (37) so that it can be stopped so a pulse of air from air line (37) through tube (35) can be directed through hole (36) to eject ball from pocket (13) onto ball track (14). There is a stepper motor (39) connected through friction wheel (38) to drive and control the rotation of (40).

Referring to fig. 3 there are air jets positioned on the rim (15) with one set of air jets A directed in one direction and one set of air jets B directed in the opposite direction. The air jets are controlled automatically by a computer and a possible control system is shown schematically with the air jets operated by solenoids controlled by a computer so the system is automatic and each spin of the rotor is in the opposite direction to the preceding spin.

In fig. 4 there are ball stops (33). At the start the ball (22) is in position 'a' in a pocket (13), a pulse of air is pumped through air line (37) tube (35) and hole (36) and the ball is ejected from the pocket by the air and moves outward until it is in position 'b'. After the ball leaves the pocket (13) the rotor is spun in the reverse direction from its previous spin. The air jets are directed in the opposite direction in which the rotor is now spinning and they impart a force to the ball which causes the ball to continue to move around the ball track on or near the rim.

Bets can now be made, if not made before, the air jets are turned off and the ball releases from the position shown and spirals down the slope until it lands in a pocket (13) in counter rotating rotor (11). The pocket is noted by the detection means as the rotor comes to rest and the bets are settled. This process can then be repeated.

On the next spin the air jets B are operated to cause the ball to circulate on the ball track in the opposite direction.

In sequence the steps are:-

1. Ball is sitting in a pocket in the rotating rotor as previous game has closed. Payouts from previous game have been made and people are now placing bets.

2. As the rotor slows down and passes air line (37) a jet of air through hole (36) ejects the ball out of the pocket and up the ball track, the ball then moves to the outside of the ball track.

3. One set of air jets are turned on and the ball circulates along the rim of the ball track.

4. As soon as the ball has left the rotor, the rotor is made to turn in the opposite direction at a speed at which a casino croupier would generally keep the wheel turning.

5. Suddenly the air jets are turned off and the ball will carry on and then spin as if it had been fired by the dealer; the ball spirals down in the same way as when fired by a croupier and comes to rest in a pocket in the rotor when payouts etc. can be made and the sequence can be restarted, with the opposite or same direction of spin of the rotor.

Referring to fig. 5, there is an outermost section (18) of ball track (19), the rim (16) and edge (18) are made of a plastic strip. There is an air inlet (20) through which compressed air can be jetted out.

In use the ball (17) is ejected from the pocket as described above and moves to the outer edge of ball track (19) and rests against rim (16). When the wheel slows down the air jet is operated to maintain the ball against rim (16) by centrifugal force. When  
5 the air jet is turned off the ball spirals down to a pocket as described above.

The invention recreates what a croupier does, except that no dealer has had a hand in the procedure. In particular, in play, the ball spins one way and the ball the other way and the ball comes to rest in a pocket as in manually operated games.

## Claims

- 5 1. A gaming apparatus which comprises (i) a stationary base; (ii) a wheel having a rotor rotatably mounted on a vertical axis with respect to the base, the rotor having pockets on its periphery into which a ball can be received with each pocket being associated with a number; (iii) a peripheral inclined surface concentric with the rotor for receiving a ball rollably thereon in which the ball will roll into one of the pockets when the ball slows, the said surface comprising a circular, inclined ball track,  
10 disposed above, and radially outwardly of the rotor and (iv) means to propel the ball along the ball track, each pocket having a hole in its lower surface and there being at least one air injection means which is connectable to the said hole so that a ball received in a pocket can be ejected from the pocket onto the peripheral inclined surface by air coming out of the hole.  
15
2. A gaming apparatus as claimed in claim 1 which is a roulette wheel.
3. A gaming apparatus as claimed in claim 1 or 2 in which the air injection means comprises a nozzle connected to air pump or source of air at above atmospheric  
20 pressure.
3. A gaming apparatus as claimed in claim 1 or 2 in which there are a plurality of air injection means.
- 25 4. An apparatus as claimed in any one of claims 1 to 3 in which there is a ball detector means which can sense which pocket the ball has finished in and means to bring the wheel to a virtual standstill with that pocket aligned with a nozzle.
5. An apparatus as claimed in any one of claims 1 to 4 in which there is a fixed rim  
30 positioned peripherally outward and at the top of the ball track.

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6. An apparatus as claimed in any one of claims 1 to 5 in which the means for propelling the ball along the ball track comprise means to give an impulse to the ball as it is positioned on the ball track.
- 5 7. An apparatus as claimed in claim 6 in which the means to give an impulse to the ball comprises at least one air jet positioned at the outer edge of the ball track which can direct a jet of air at the ball thus impelling the ball along the ball track.
8. An apparatus as claimed in claim 7 in which there are a plurality of air jets  
10 positioned around the edge of the ball track.
9. An apparatus as claimed in claim 7 or 8 in which there are two sets of air jets one set directed to propel a ball in one direction around the ball track and the other set directed to propel the ball in the opposite direction.
- 15 10. An apparatus as claimed in any one of claims 6 to 9 in which there is a rim fixed to the outer edge of the ball track and, in use, when the ball reaches the outside edge of the ball track it is held against the rim by the action of centrifugal force and there are control means which operate the air jets to give an impulse or impulses of  
20 compressed gas to the ball and, after a predetermined time, the air jets can be turned off so the ball then spirals down the ball track to the contra rotating wheel.
11. An apparatus as claimed in any one of the preceding claims in which the outermost section of the ball track slopes at an angle to the horizontal which is less  
25 than the angle at which the inner section of the ball track slopes to the horizontal.
12. An apparatus as claimed in any one of claims 1 to 11 in which there is a ball reader which can automatically detect and record the position of the ball in a pocket.
- 30 13. An apparatus as claimed in any one of the preceding claims in which there is a transparent cover over the apparatus.

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14. An apparatus as claimed in any one of claims 7 to 12 in which there is a transparent sheet which fits into the apparatus in the rim above the air jets.

5 15. An apparatus as claimed in claim 14 in which the rotor is mounted so that it fits beneath the sheet and above the sheet is a static turret in line with the rotor which turret has a smooth reflective surface.

10 16. An apparatus as claimed in any one of claims 7 to 12 in which there are a plurality of ball stops uniformly located around the peripheral inclined surface.

17. An apparatus as claimed in any one of the preceding claims in which the motor is a stepper motor.

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### Abstract

- 5 An automatic roulette wheel in which at the end of a turn the wheel is accelerated and the ball is ejected from the pocket by a jet of air and moves to the top of the ball track and the direction of rotation of the wheel reversed. The ball is held against the edge of the ball track by air jets and, after a predetermined time, the ball spirals down the slope into a pocket on the wheel.





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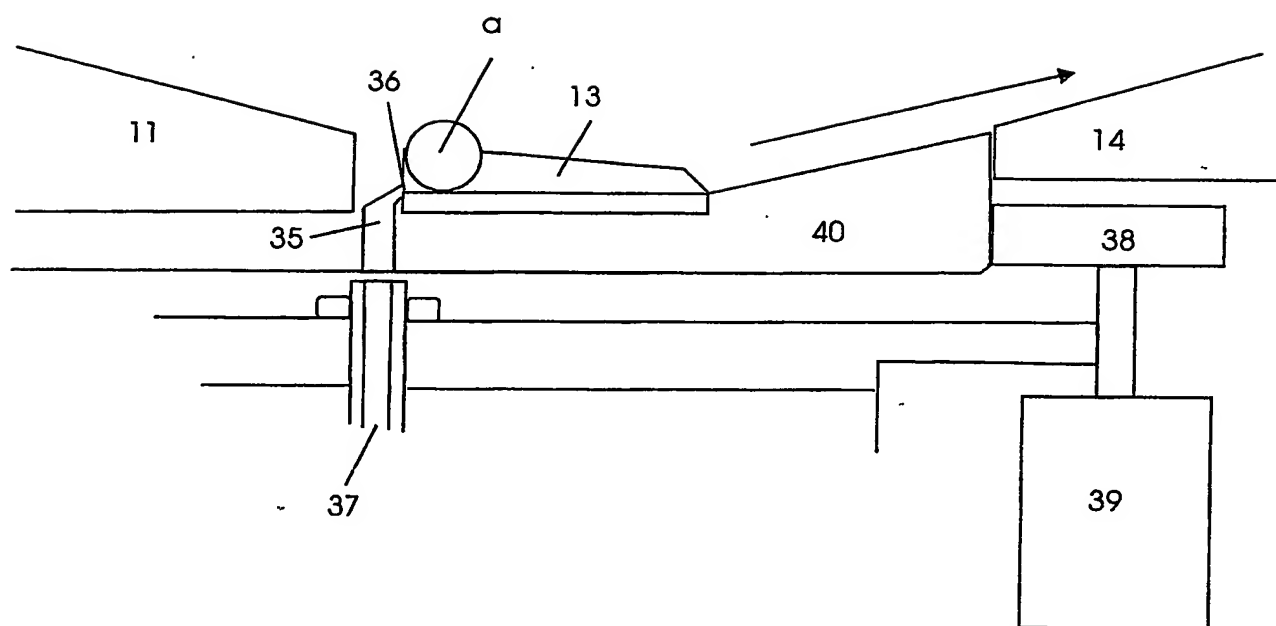


Fig. 2

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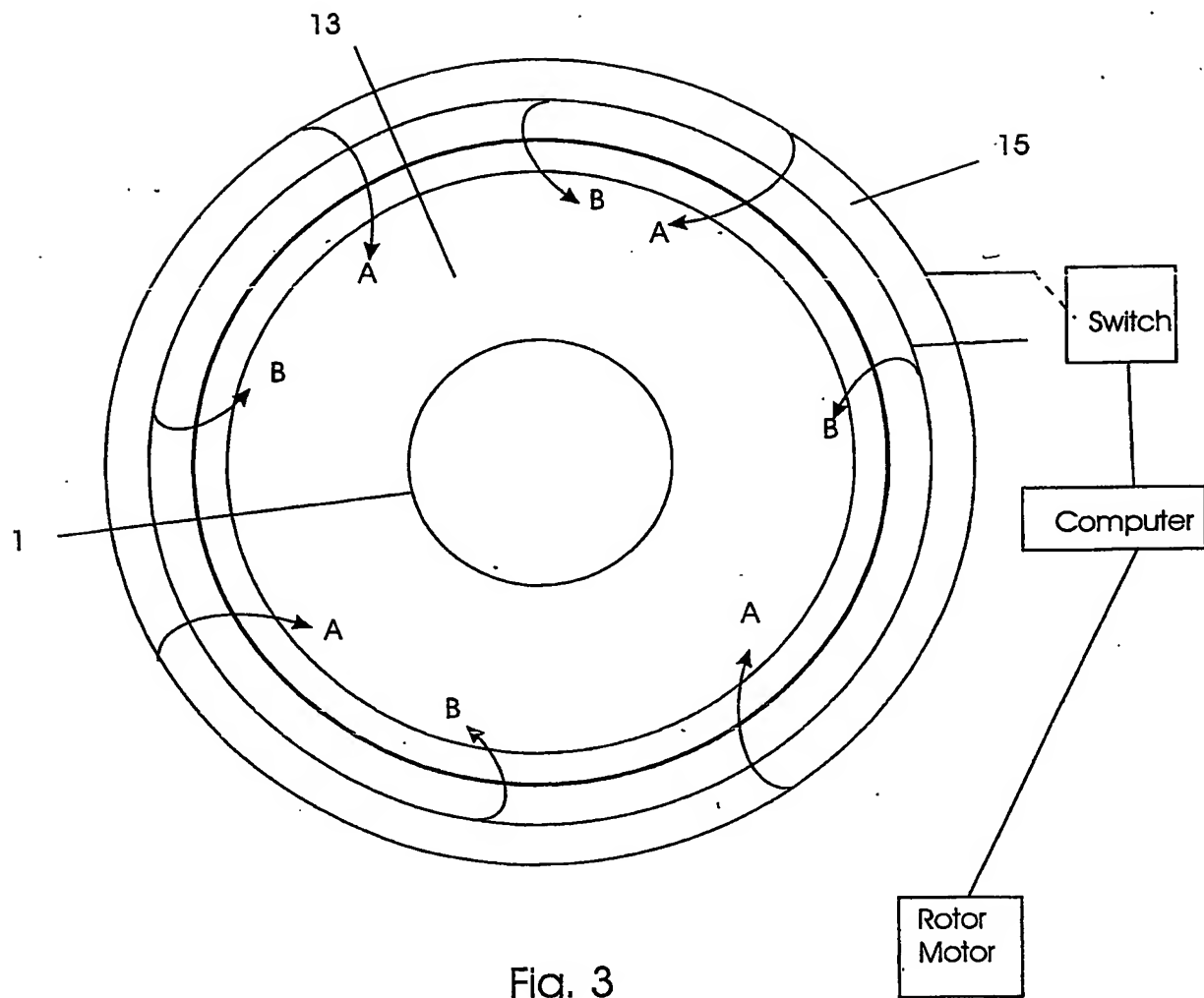


Fig. 3

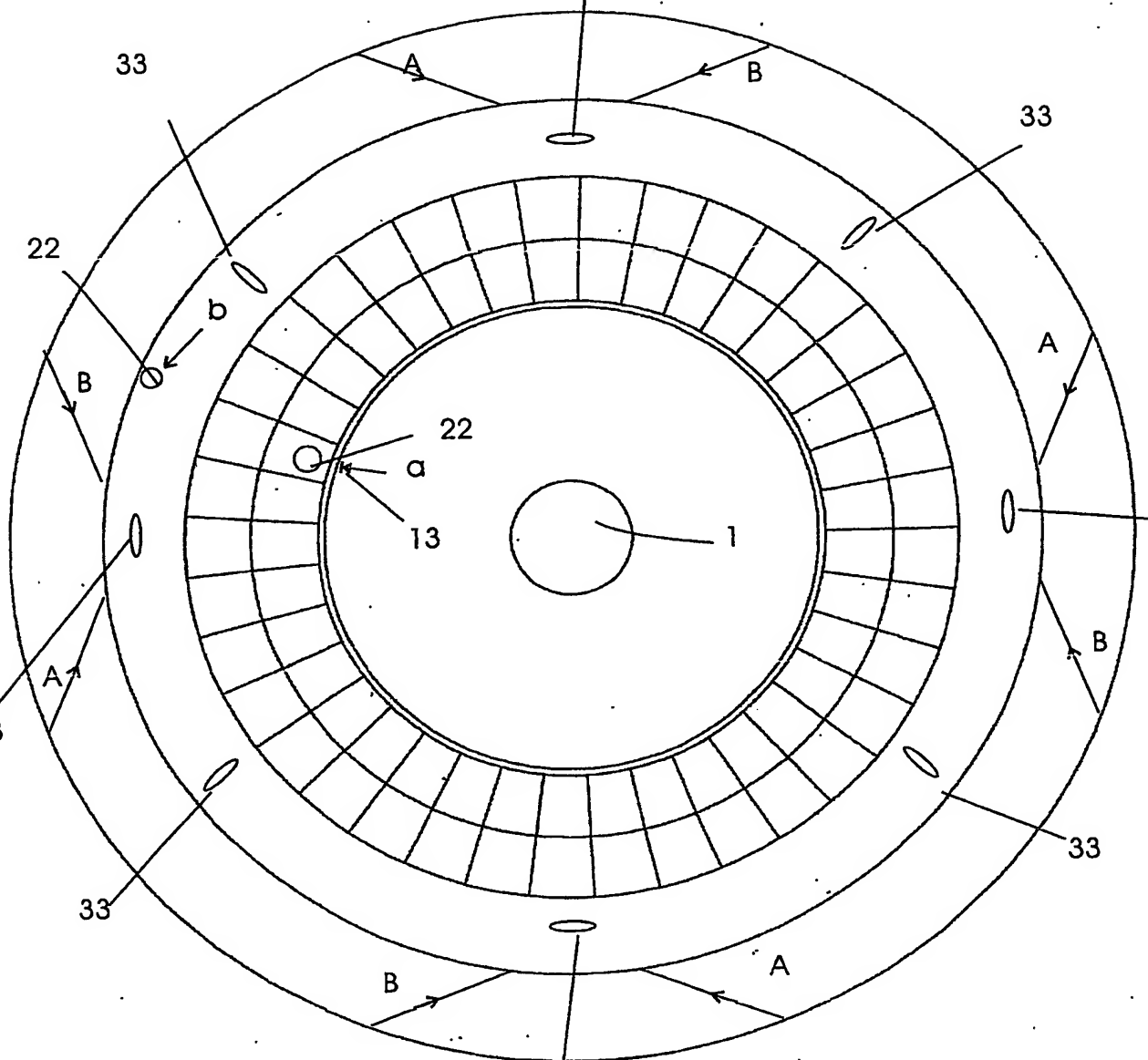


Fig. 4

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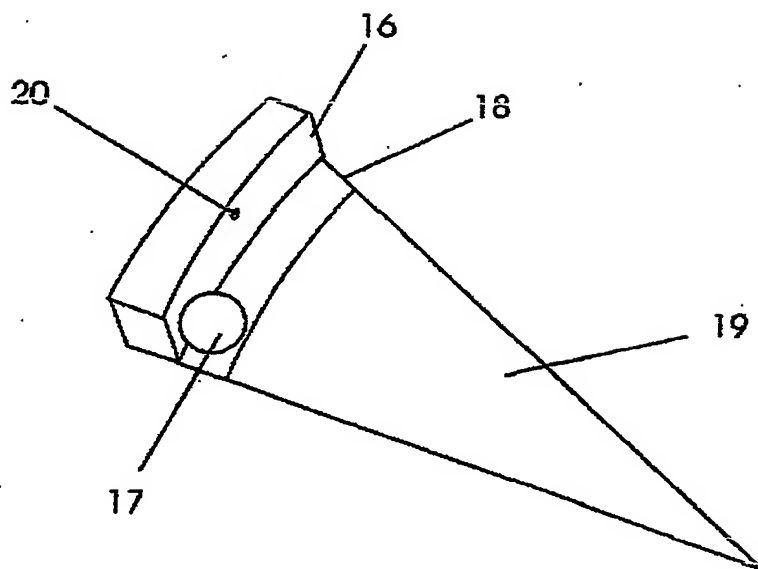


Fig. 5



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